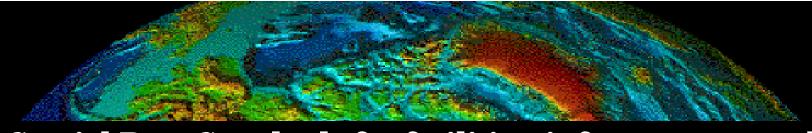
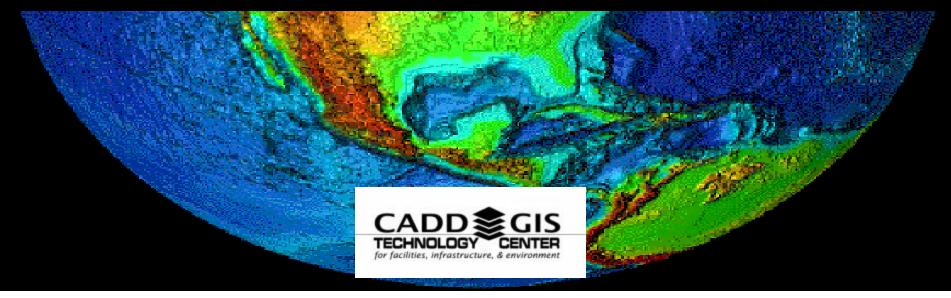
Center's Internet Web Page URL Address: http://tsc.wes.army.mil



Spatial Data Standards for facilities, infrastructure, and environment (SDSFIE) and

Facility Management Standards for facilities, infrastructure, and environment (FMSFIE)

TOOLBOX





CADD/GIS Technology Center

for facilities, infrastructure, and environment

- Originally established as the "Tri-Service CADD/GIS Technology Center" in 1992 at the Army Waterways Experiment Station, Information Technology Laboratory, Vicksburg, Mississippi .
- Established by the Army (including Army Corps of Engineers), Navy, and Air Force (i.e, Tri-Services).
- Center's name changed to "CADD/GIS Technology Center for facilities, infrastructure, and environment" in July, 1999 to reflect a broader mission.
- CADD Computer Aided Design & Drafting
- GIS Geographic Information System

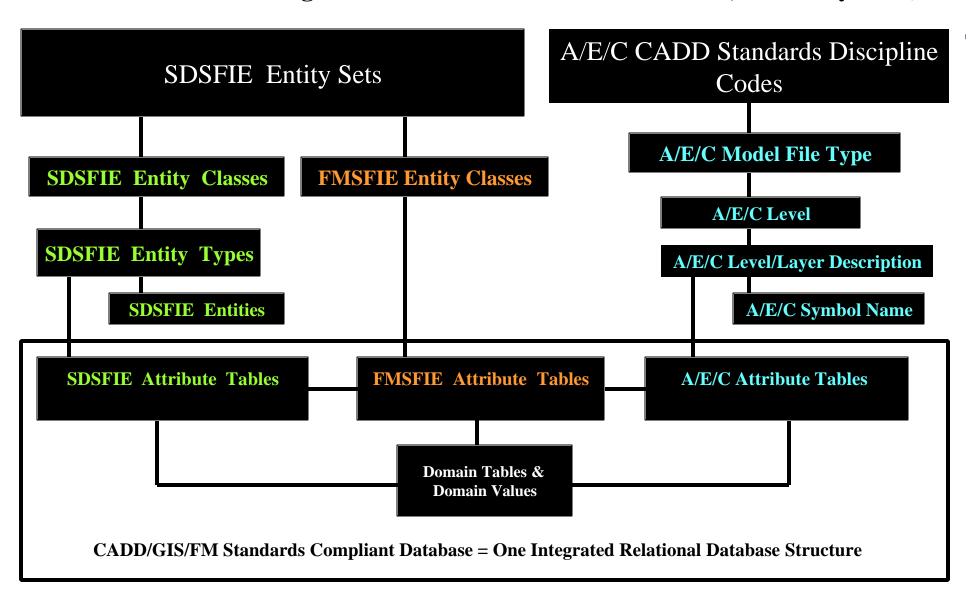


Participating DoD and Governmental Agencies

- Participating Department of Defense (DoD) and Federal Government Agencies (as of January 2001):
- U.S. Army Corps of Engineers
- U.S. Army
- U.S. Navy
- U.S. Air Force
- U.S. Marines
- National Aeronautics and Space Administration (NASA)
- Defense Logistics Agency (DLA)
- U.S. Coast Guard
- General Services Administration (GSA)
- National Institute of Building Sciences (NIBS)
- U.S. Environmental Protection Agency

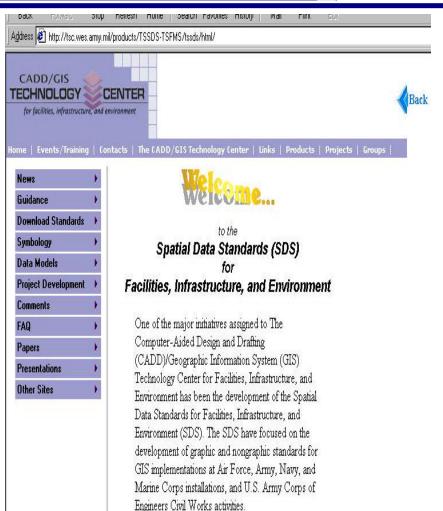
CADD/GIS/FM Standards Data Model

(Option 1 concept for initial incorporation of FMSFIE with SDSFIE & A/E/C CADD Standards. Began with TSSDS/TSFMS Release 1.80, February 1999)





Center Project No. 96.013 - Spatial Data Standards



- The Spatial Data Standards for facilities, infrastructure, & environment (SDSFIE) are CADD/GIS Technology Center Project No. 96.013.
- Monthly Status Reports are provided on CADD/GIS Technology Center web site (http://tsc.wes.army.mil) under "Projects".
- Typically, 2 "SDS Implementation Workshops" are provided each year at Vicksburg, Mississippi. See "Classes" area of CADD/GIS Technology Center web site.
- Download latest release and additional SDSFIE information from the "Products", "Standards" area of the CADD/GIS Technology Center's web site.



Part 3: Spatial Data Standards for facilities, infrastructure, & environment (SDSFIE)

- Provides a standard graphic and nongraphic (database) format and structure for GIS implementations at Air Force, Army, Navy, and Marine Corps installations and Army Corps of Engineers Civil Works activities. Also provides a GIS standard for use by other Federal, State, and Local Government organizations, public utilities; and private industry.
- Provides a "nonproprietary" standard designed for use with commercially available "off-the-shelf" GIS and relational database software.
- Provides a GIS implementation schema for approved FGDC and DISA geospatial related data standards.
- Provides a grouping of geographically referenced (geospatial) features (i.e., features which can be depicted graphically on a map at their geographic location (coordinate). Each geospatial feature has an "attached" Attribute Table containing pertinent data about the geospatial feature.
- Called Tri-Service Spatial Data Standards (TSSDS) prior to July 1999. The acronym SDS was used from July 1999 until January 2001.



Center Project No. 96.015 – **Facility Management Standards**







Facility Management Standards (FMS)

Facilities, Infrastructure, and Environment

One of the major initiatives assigned to The Computer-Aided Design and Drafting (CADD)/Geographic Information System (GIS) Technology Center for Facilities, Infrastructure, and Environment has been the development of the Facility Management Standards for Facilities, Infrastructure, and Environment (FMS).

- The Facility Management Standards for facilities, infrastructure, & environment (FMSFIE) are CADD/GIS **Technology Center Project No.** 96.015.
- Monthly Status Reports are provided on CADD/GIS Technology Center web site (http://tsc.wes.army.mil) under "Projects".
- Download latest release and additional FMSFIE information from the "Products", "Standards" area of the CADD/GIS Technology Center's web site.



Part 3: Facility Management Standards for facilities, infrastructure, & environment (FMSFIE)

- Provides a standard database format and structure for "business" and event data (e.g., inspections, repairs) related to SDSFIE geospatial features and/or A/E/C CADD objects, specifically for CADD/GIS Based implementations at Air Force, Army, Navy, & Marine Corps installations and Army Corps of Engineers Civil Works activities. Also provides a CADD/GIS Based FM standard for use by other Federal, State, and Local Government organizations, public utilities; and private industry.
- Provides a "nonproprietary" standard designed for use with commercially available "off-the-shelf" CADD, GIS, FM, and relational database software.
- Provides a grouping of related attribute tables containing "business and event data.
- Called Tri-Service Facility Management Standards (TSFMS) prior to July 1999. The acronym FMS was used from July 1999 until January 2001.
- The first FMSFIE release was included with the TSSDS/TSFMS Release 1.80, which was published on CD-ROM in February 1999. Releases 1.90 and 1.95 were published on CD-ROM in December 1999 and April 2000, respectively. Release 2.00 was completed in January 2001.



Spatial Data and Facility Management Standards - Design Considerations

- Must be compatible with the predominant Commercially Available CADD, GIS, & Relational Database Software.
- GIS and CADD Software include:

ESRI Arc/Info
 Bentley MicroStation
 ESRI ArcView

Autodesk MapIntergraph MGEAutodesk AutoCAD

Intergraph GeoMedia - Bentley GeoGraphics

- Relational Database Management System (RDBMS) Software includes:
 - ANSI Standard Structured Query Language (SQL)

Informix SQL
 Microsoft Access - ESRI SDE

Oracle SQL- Microsoft SQL Server

- Operating Systems include:
 - UNIX
 - Windows 95, 98, 2000, and NT



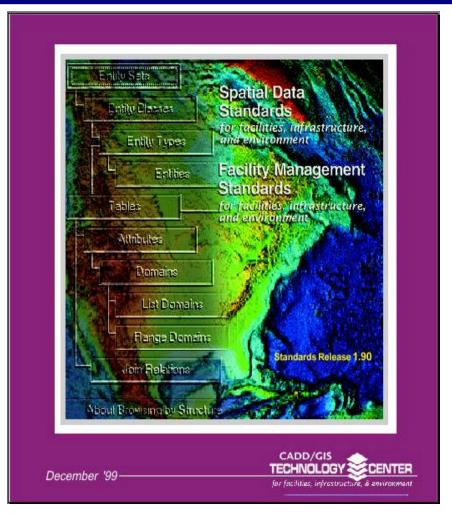
Spatial Data and Facility Management Standards – Software Tools

Interactive Windows Application

- Self-contained Microsoft Visual Basic (32 bit) based Software Applications for Windows 95, 98, 2000, and NT.
- Runs on Windows 95, 98, 2000, and/or NT Personal Computer
- No Additional Software Required
- Distributed on CD-ROM and via Internet
- A "Living Application"; Versioning
- The current version (Release 2.00) was completed in January 2001.
- The current version is also available for download from The
 CADD/GIS Technology Center Internet Web Site http://tsc.wes.army.mil.
 Go to "Products", then select either "Spatial Data Standards" or "Facility Management Standards."



Spatial Data Standards (SDSFIE) & Facility Management Standards (FMSFIE) - Development History



- TSSDS Release 1.20 November 1993.
- TSSDS Release 1.40 August 1995.
- TSSDS Release 1.60 November 1996.
- TSSDS Release 1.70 August 1997.
- TSSDS Release 1.75 January 1998.
- TSSDS/TSFMS Release 1.80 February 1999.
- SDS/FMS Release 1.90 December 1999
- SDS/FMS Release 1.95 April 2000
- SDSFIE/FMSFIE Release 2.00 January 2001



SDSFIE/FMSFIE Data Model Organization

• Entity Sets -

Broad grouping for data management purposes.

Entity Classes -

• Grouping of data within each Entity Set for Data Management Purposes.

Entity Types -

• Grouping of SDS Geospatial Features (i.e., items that appear graphically on a map or drawing). Grouped within each Entity Class.

- Entities -

• Items that appear graphically on a map or drawing. Grouped within each Entity Type. Each Entity Type may have one or more Entities.

Attribute Tables -

• Relational database tables containing attribute data. Grouped within each Entity Class.

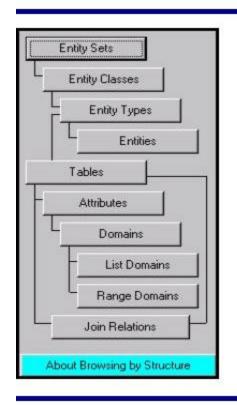
Domain Tables -

• Contains lists of "valid" or "permissible" values for specific attributes in an Attribute Table.



Size and Complexity - SDS/FMS Release 2.000

Size and Complexity - SDSFIE/SDSFIE Release 2.000



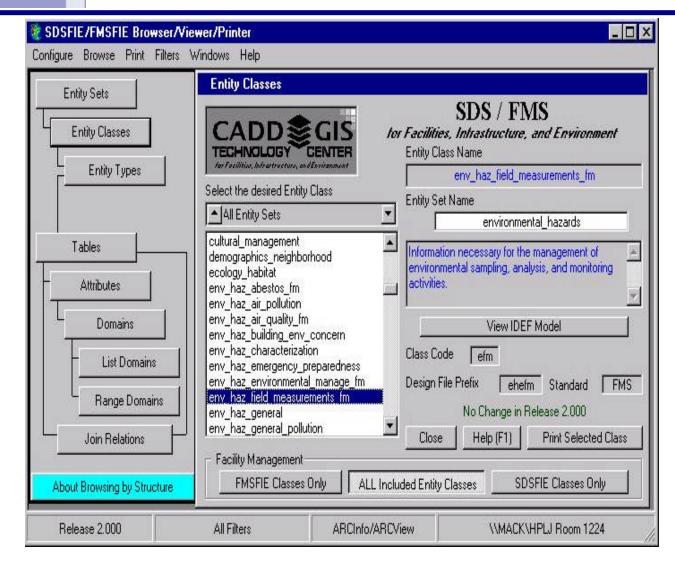
26	Entity Sets
181	Entity Classes
1,006	Entity Types
5,453	Entities (CADD & CADD Based GIS)
1,014	Attribute Tables (Database Tables)
25,844	Attributes (Fields in Tables)
959	Domain Tables (List & Range)
21,542	List Domain Values
18	Range Domains
8,149	Relational Database Join Relationships



SDSFIE/FMSFIE Software Application - Browser

SDSFIE/FMSFIE Browser Software Application:

- Provides a tool for viewing & printing the various components of the Standards.
- Permits the User to view/print Standard based upon their specific CADD/GIS software.
- Permits the User to view/print either: (1) entire Standard, (2) predefined "filter", or (3) User's custom filter.

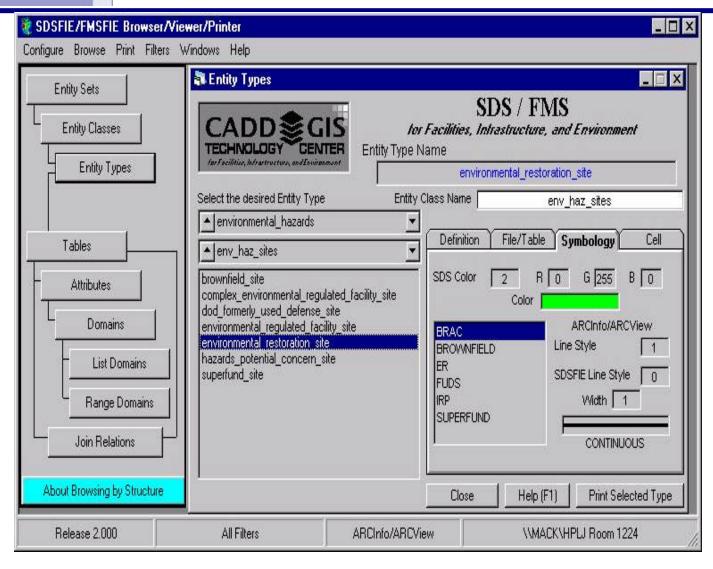




SDSFIE/FMSFIE Software Application - Browser

SDSFIE/FMSFIE Browser Software Application:

- Provides a tool for viewing & printing the various components of the Standards.
- Permits the User to view Standard color, linestyles, & symbols.

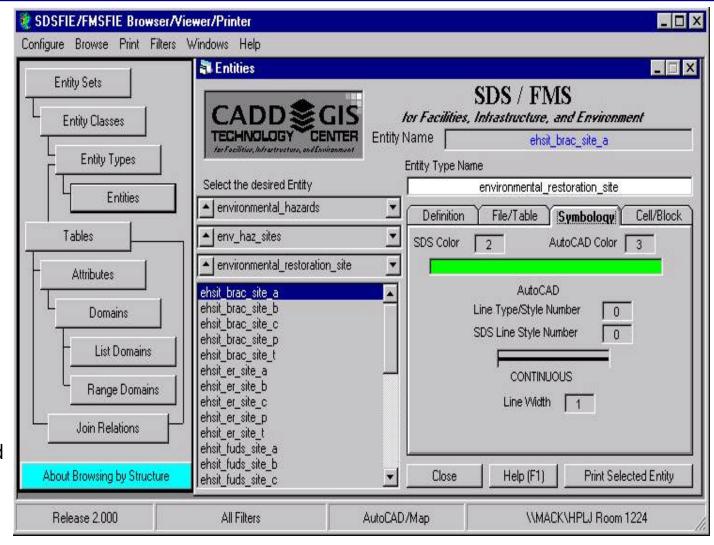




SDSFIE/FMSFIE Software Application - Browser

SDSFIE/FMSFIE Browser Software Application:

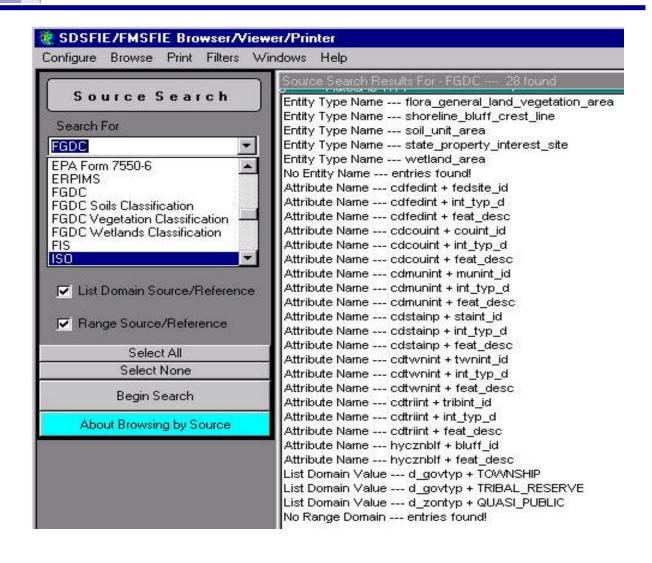
- Provides a tool for viewing & printing the various components of the Standards.
- Permits the User to view Standard color, linestyles, & symbols.
- AutoCAD Map is a CADD Based GIS with Layer assignments for placement of features, text, & linestyles (called Entities).





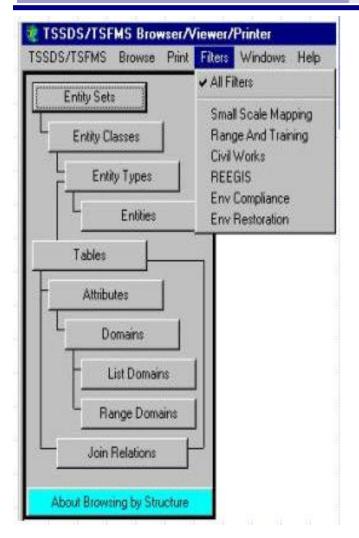
Incorporation of Approved FGDC Data Standards

- •The SDSFIE/FMSFIE provides a GIS Implementation Schema for Approved Federal Geographic Data Committee (FGDC) Data Standards.
- Approved FGDC Soils, Vegetation, and Wetlands Classification Standards were incorporated in the TSSDS/TSFMS Release 1.80.





Spatial Data Standards (SDSFIE) & Facility Management Standards (FMSFIE) - Filters



"Filter" Concept and Capability was first introduced with the TSSDS/TSFMS Release 1.80.

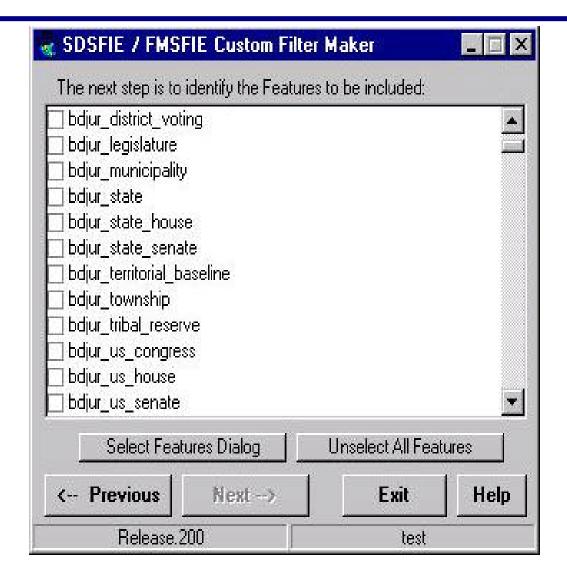
- "Filters" are a subset of the SDSFIE/FMSFIE.
- "Filters" can be "Pre-Defined" (i.e., defined by a User Group and provided by the Center with the SDSFIE/FMSFIE Release) or "User-Defined" (i.e., defined by a User through use of the SDSFIE/FMSFIE Filter Maker Application).
- SDSFIE/FMSFIE contains an enormous amount of detail and information. Most GIS implementations use a subset of the SDSFIE/FMSFIE. "Filters" simplify development of a SDSFIE/FMSFIE compliant GIS through the identification and use of a defined SDSFIE/FMSFIE subset.



SDSFIE/FMSFIE Software Application – Filter Maker

SDSFIE/FMSFIE Filter Maker Software Application:

• Provides a tool which permits the User to define their own subset of the SDSFIE/FMSFIE for use in GIS development.

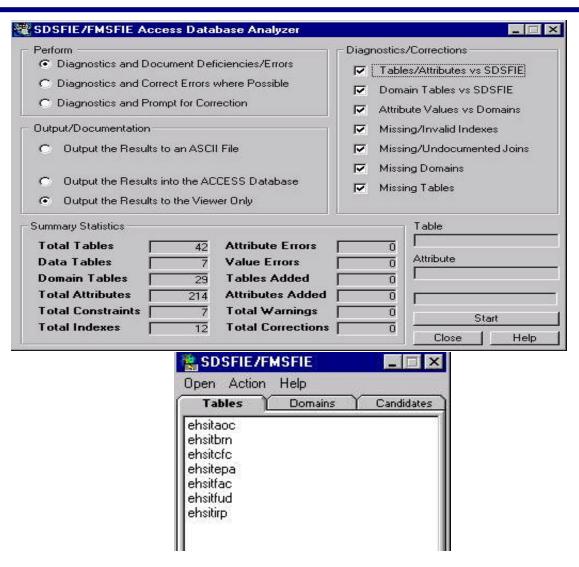


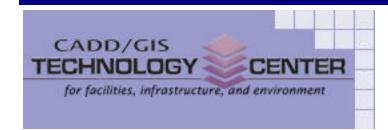


SDSFIE/FMSFIE Software Application – Access Builder

SDSFIE/FMSFIE Access Builder Software Application:

- Provides a tool which permits the User to build SDSFIE/FMSFIE compliant Microsoft Access 97 attribute & domain tables, complete with joins.
- Provides a tool which permits the User to check and run diagnostics on SDSFIE/FMSFIE compliant Microsoft Access 97 database tables.

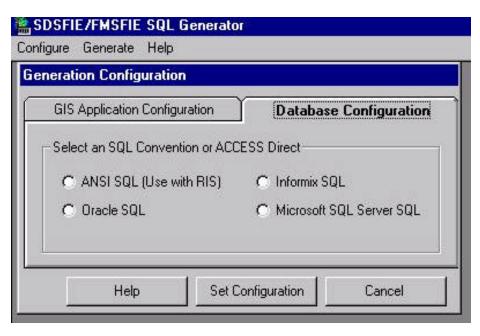


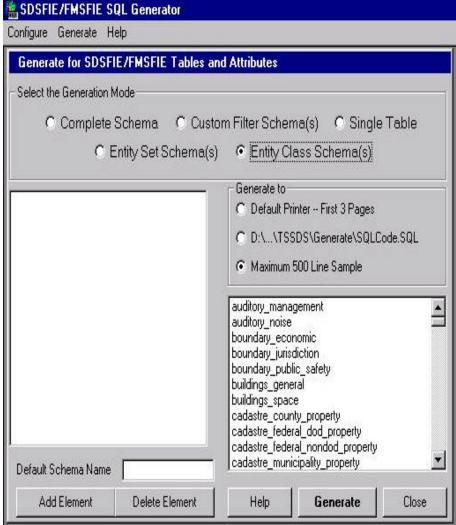


SDSFIE/FMSFIE Software Application – SQL Generator

SDSFIE/FMSFIE SQL Generator Software Application:

• Provides a tool which permits the User to build SDSFIE/FMSFIE compliant ANSI SQL, Oracle SQL, Informix SQL, and SQL Server databases.



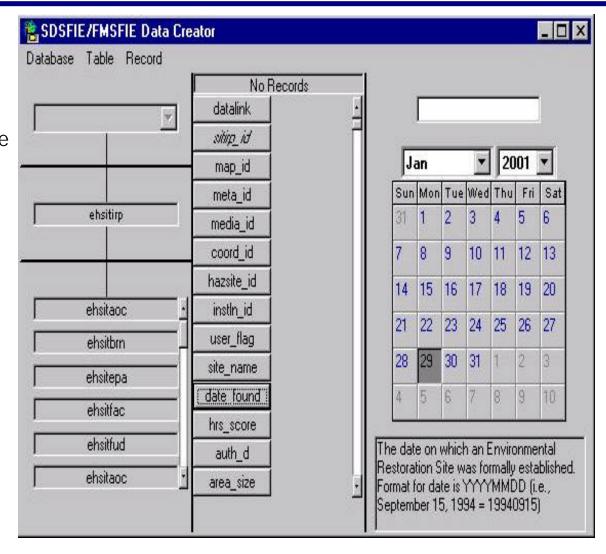




SDSFIE/FMSFIE Software Application – Data Creator

SDSFIE/FMSFIE Data Creator Software Application:

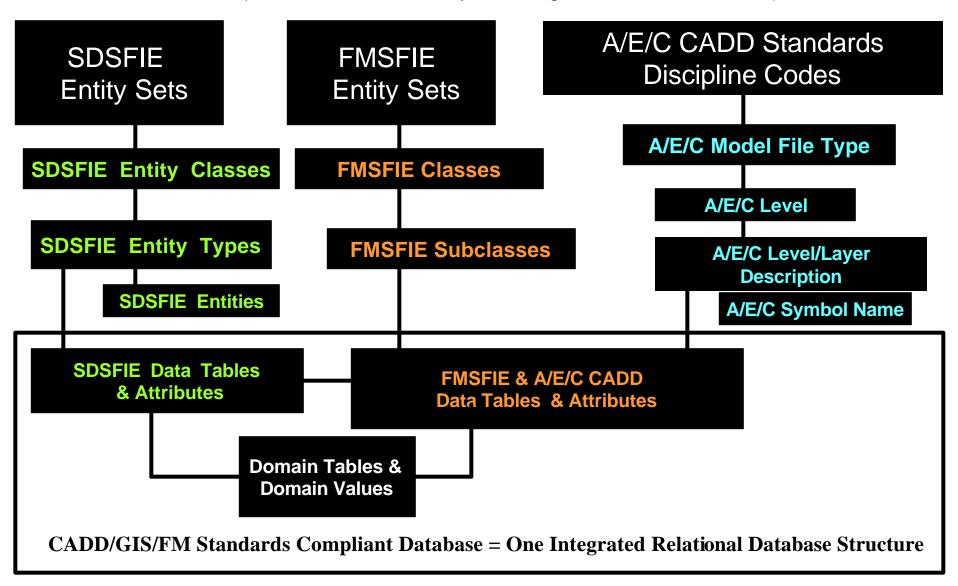
 Provides a tool which permits the User to manually input data in SDSFIE/FMSFIE compliant Microsoft Access 97 database tables.



CADD/GIS/FM Standards for Facilities, Infrastructure, & Environment (FIE) Data Model

(Option 2 Concept for incorporation of "transactional" FMSFIE with SDSFIE & A/E/C Standards.

Development of FMSFIE Entity Sets began in Fiscal Year 2001)





Bobby G. Carpenter, P.E.

Environmental Engineer

CADD/GIS Technology Center for facilities, infrastructure, and environment CEERD-ID-C

Army Engineer Research and Development Center at Waterways Experiment Station 3909 Halls Ferry Road Vicksburg, MS 39180-6199

> phone: 601-634-4572 fax: 601-634-4584

E-mail: carpenb@wes.army.mil

CADD/GIS Technology Center Internet URL: http://tsc.wes.army.mil